ES20
Compact Sampling System
User's Manual

97447 Issue 1
August 2014

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ES20
Compact Sampling System

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Safety

The manufacturer has designed this equipment to be safe when operated using the procedures detailed in this manual. The user must not use this equipment for any other purpose than that stated. Do not apply values greater than the maximum value stated.

This manual contains operating and safety instructions, which must be followed to ensure the safe operation and to maintain the equipment in a safe condition. The safety instructions are either warnings or cautions issued to protect the user and the equipment from injury or damage. Use competent personnel using good engineering practice for all procedures in this manual.

Electrical Safety

The instrument is designed to be completely safe when used with options and accessories supplied by the manufacturer for use with the instrument.

Pressure Safety

DO NOT permit pressures greater than the safe working pressure to be applied to the instrument. Refer to Appendix A, Technical Specifications.

Toxic Materials

The use of hazardous materials in the construction of this instrument has been minimized. During normal operation it is not possible for the user to come into contact with any hazardous substance which might be employed in the construction of the instrument. Care should, however, be exercised during maintenance and the disposal of certain parts.

Repair and Maintenance

The instrument must be maintained either by the manufacturer or an accredited service agent. Refer to www.michell.com for details of Michell Instruments' worldwide offices contact information.

Safety Conformity

This product meets the essential protection requirements of the relevant EU directives. Further details of applied standards may be found in Appendix A, Technical Specifications.

Abbreviations

The following abbreviations are used in this manual:

AC	alternating current
barg	pressure unit (=100 kP or 0.987 atm)
ºC	degrees Celsius
ºF	degrees Fahrenheit
DC	direct current
dp	dew point
Hz	Hertz
kg	kilogram(s)
lb	pound
Nl/min	normal liters per minute
mA	milliampere
max	maximum
min	minute(s)
%	percentage
psig	pounds per square inch
scfh	standard cubic feet per hour
temp	temperature
V	Volts
W	Watts
Ω	Ohms

Warnings

The following general warning listed below is applicable to this instrument. It is repeated in the text in the appropriate locations.

Where this hazard warning symbol appears in the following sections it is used to indicate areas where potentially hazardous operations need to be carried out.

1 INTRODUCTION

Michell Instruments designs and manufactures a broad range of sampling systems for a wide spectrum of industries and processes from the economical compressed air market to the oil and gas process market.

The ES20 Compact Sampling System (CSS) is a standard modular product designed to appeal to customers who require an economic system delivered for fast integration into their own work package.

Fast delivery is achieved through a simple modular build system on a single base plate design completed with supply chain stocking of all required ES20 CSS parts.

The ES20 CSS is a standard fast delivery product, covering a small portion of the Michell Instruments' overall sampling system and process analyzer sampling system capabilities.

1.1 Materials

To ensure continuous and reliable dew-point or moisture measurement it is important that the dew-point transmitter is exposed to stable conditions of the gas to be monitored.

The ES20 CSS utilizes high quality materials which ensure that the sample gas travels smoothly through the system.

Gas wetted parts:

- Stainless steel tube, filter housing and fittings (316 stainless steel)
- Filter element (borosilicate glass microfibers)
- Transmitter sample block (316 stainless steel)
- Flowmeter (borosilicate glass) with Viton® seals
- Pump (Teflon®)

1.2 Filtration

If the gas contains impurities it is crucial to remove the contaminants before they reach the sensing device. The ES20 CSS is supplied with a filter housing into which recyclable particulate or coalescing filter cartridges can be inserted.

Filtration methods:

- Particulate filter (solid contaminants)
- Coalescing filter with adjustable drain (solid and liquid aerosol contaminants)
- HDPE guard (filter) for sensing element (standard)
- Air filter (with vacuum pump (standard)

1.3 Pressure Control and Measurement

Pressure has a direct effect on dew point. The ES20 CSS utilizes a set of configurable options for atmospheric or system line pressure dew-point measurement.

Pressure control features:

- Pressure gauge (dual scale: bar and psi)
- Isolation valves (needle valve type)
- Self-regulating vacuum pump

1.4 Flow Control

Flow rate of a gas can affect the transmitter's accuracy and influence the systems' response time. Every sampling system contains a set of components which help to maintain optimum flows of 1 to 5 Nl/min (2.1 to 10.6 scfh).

Flow control:

- Flowmeter (with particulate or coalescing filter)
- Isolation valves (needle valve type)
- Flowmeter with needle valve (with vacuum pump only)

1.5 Mounting Variants

Depending on the application the sampling system can be supplied in 3 variations:

- Mounted on base plate
- Mounted on base plate inside a windowed GRP enclosure
- Mounted on base plate inside a windowed SS enclosure (316 stainless steel)

1.6 System Designs

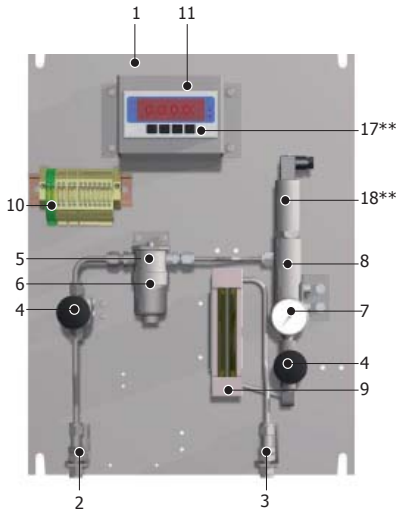
The ES20 CSS can be supplied in various configurations and can be used with many Michell products such as:

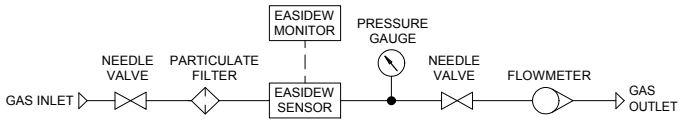
- Easidew Transmitter
- Easidew I.S. Transmitter
- Easidew PRO I.S. Transmitter
- Easidew Online Hygrometer
- Cermet II Hygrometer

1.7 System Configurations

ES20 CSS fitted with Particulate Filter

	Components used	Specifications
1	Base plate	316 stainless steel
2	Inlet process connection and material	6mm or ¼" fitting (316 stainless steel)
3	Outlet process connection and material	6mm or ¼" fitting (316 stainless steel)
4	Isolation valve	Needle valve type
5	Filter housing	316 stainless steel (340 barg maximum), gasket (Viton®)
6	Particulate filter (inside filter housing)	Borosilicate glass microfibres (99.5+% removal of 0.1 micron particles)
7	Pressure gauge	0 to 20 barg (dual scale: bar and psi)
8	Sensor sample block	5/8" SS sample block (316 stainless steel)
9	Flowmeter	Borosilicate glass (2 to 12 Nl/min), seals (Viton®)
10	Terminal rail	13 terminals
11	Process indicator mounting bracket (optional)	1/8 DIN cutout

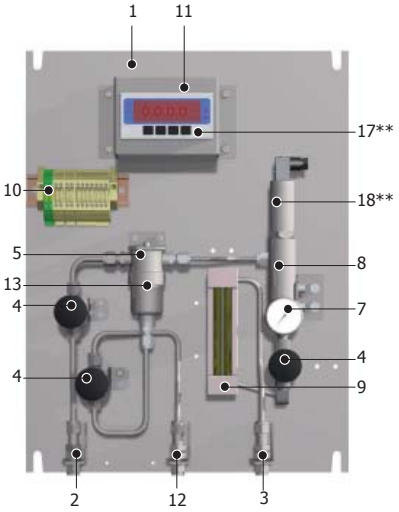


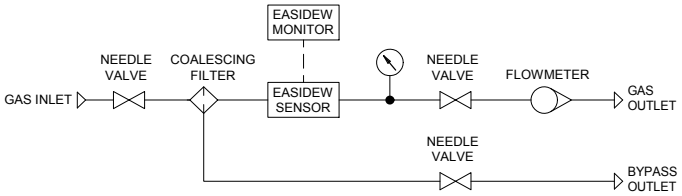


ES20 CSS fitted with Coalescing Filter*

	Components used	Specifications
12	Drainage connection	6mm or ¼" fitting (316 stainless steel)
13	Coalescing filter (inside filter housing)	Borosilicate glass microfibres (99.5+% removal of 0.1 micron particles and aerosols)

***In addition to particulate filter fitted components**

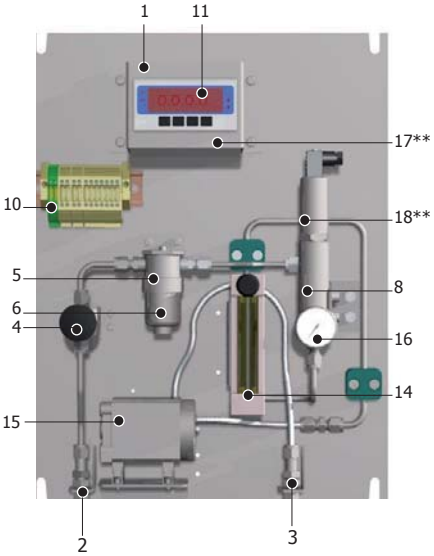


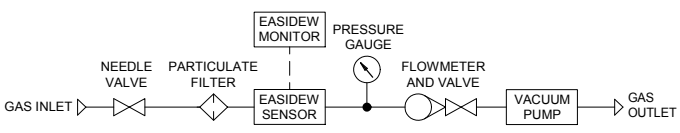


ES20 CSS fitted with Vacuum Pump*

	Components used	Specifications
14	Flowmeter with needle valve	Borosilicate glass (2 to 12 Nl/min), seals (Viton®)
15	Vacuum pump	Anti-overpressure mechanism (Teflon®)
16	Pressure gauge	-1 to 1 barg

***In addition to particulate filter fitted components**



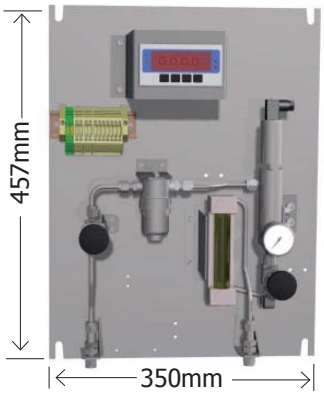


Optional Dew-Point Measurement Device

	Components used	Specifications
17	Monitor *(to be ordered separately)***	Refer to Monitor datasheet
18	Dew-Point Transmitter *(to be ordered separately)***	Refer to Transmitter datasheet

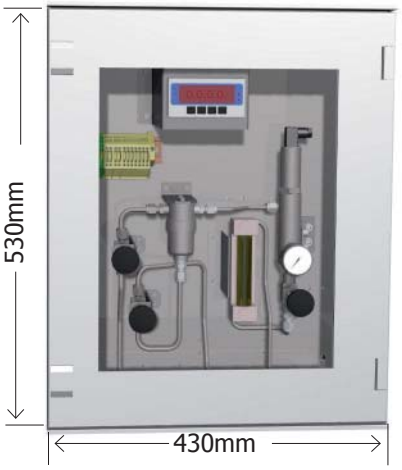
1.8 Enclosure Configurations

Base Plate



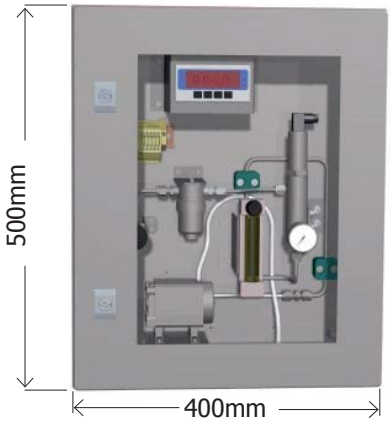
2mm (D)

GRP Enclosure



200mm (D)

Stainless Steel Enclosure



200mm (D)

2 INSTALLATION

2.1 Sampling System Installation

It is essential that the connection of electrical and gas supplies to this instrument be undertaken by competent personnel.

Relevant sections of this manual must be read in full before commencing measurement (see below).

2.1.1 Relevant Manual Section for Installation

Please check below for the relevant product code structure and select the manual section associated with the sampling system ordered.

NOTE: Compare the 2nd (Feature B - filter) and 4th (Feature D - pressure) option from the ordered ES20 CSS product code with the table below:

Section 2.2	Section 2.3	Section 2.4
B1 - D1 Process or Atmospheric Pressure	B2 - D1 Process or Atmospheric Pressure	B1 - D2 Vacuum Pressure

2.2 Process or Atmospheric Pressure With Particulate Filter

NOTE: All other options from the product configuration have no effect on the operation described in this Section.

2.2.1 Mounting Details

The ES20 CSS base plate or enclosure is designed to be wall-mounted. It should be rigidly mounted vertically in a position free from high vibration levels and shaded from direct sunlight.

Dimensional drawings are shown in Section 1.8.

2.2.2 Gas Connections

Gas connections to the ES20 CSS are via 6mm or ¼" Swagelok® tube fittings located at the base of the mounting plate or enclosure.

Connections are marked as follows:

GAS IN	Sample gas entry point with a maximum supply pressure of 20 barg (145 psig)
GAS OUT	Sample gas exit point

Care must be taken to ensure that the outlet isolation valve is not fully closed.

2.2.3 Electrical Connections

All electrical connections should be made to the terminal rail supplied in the sampling system.

For GRP and SS housing versions - all cables to or from the sampling system should go through the M20 plastic cable glands provided at the base of the enclosure.

2.2.4 Power Supply

NOTE: Refer to the label on the terminal rail for the supply voltage required by the sampling system.

Go to Section 2.5 - Dew-Point Measurement System.

2.3 Process or Atmospheric Pressure With Coalescing Filter

NOTE: All other options from the product configuration have no effect on the operation described in this Section.

2.3.1 Mounting Details

The ES20 CSS base plate or enclosure is designed to be wall-mounted. It should be rigidly mounted vertically in a position free from high vibration levels and shaded from direct sunlight.

Dimensional drawings are shown in Section 1.8.

2.3.2 Gas Connections

Gas connections to the ES20 CSS are via 6mm or ¼" Swagelok® tube fittings located at the base of the mounting plate or enclosure.

Connections are marked as follows:

GAS IN	Sample gas entry point with a maximum supply pressure of 20 barg (145 psig)
GAS OUT	Sample gas exit point

Care must be taken to ensure that the outlet isolation valve is not fully closed.

2.3.3 Drainage Connections

Drainage connections to the ES20 CSS are via 6mm or ¼" Swagelok® tube fittings located at the base of the mounting plate or enclosure.

2.3.4 Electrical Connections

All electrical connections should be made to the terminal rail supplied in the sampling system.

For GRP and SS housing versions - all cables to or from the sampling system should go through the M20 plastic cable glands provided at the base of the enclosure.

2.3.5 Power Supply

NOTE: Refer to the label on the terminal rail for the supply voltage required by the sampling system.

Go to Section 2.5 - Dew-Point Measurement System.

2.4 Vacuum Pressure With Particulate Filter

NOTE: All other options from the product configuration have no effect on the operation described in this Section.

2.4.1 Mounting Details

The ES20 CSS base plate or enclosure is designed to be wall-mounted. It should be rigidly mounted vertically in a position free from high vibration levels and shaded from direct sunlight.

Dimensional drawings are shown in Section 1.8.

2.4.2 Gas Connections

Gas connections to the ES20 CSS enclosure are via 6mm or ¼" Swagelok® tube fittings located at the base of the mounting plate or enclosure.

Connections are marked as follows:

GAS IN	Sample gas entry point with a maximum supply pressure of 1 bara (14.5 psia)
GAS OUT	Sample gas exit point

Care must be taken to ensure that the outlet isolation valve is fully open.

2.4.3 Electrical Connections

All electrical connections should be made to the terminal rail supplied in the sampling system.

For GRP and SS housing versions - all cables to or from the sampling system should go through the M20 plastic cable glands provided at the base of the enclosure.

2.4.4 Power Supply

NOTE: Refer to the label on the terminal rail for the supply voltage required by the sampling system.

Go to Section 2.5 - Dew-Point Measurement System.

The following procedures must be carried out by a qualified installation engineer.

2.5 Dew-Point Measurement System

The dew-point measurement system is **NOT** supplied as standard.

A dew-point measurement system can be obtained by contacting your local distributor or Michell Instruments (see www.michell.com for details).

NOTE: Refer to the relevant installation sections from the manual supplied with Michell's dew-point measurement system.

2.6 Monitor Installation

The monitor is **NOT** supplied as standard.

A monitor can be obtained by contacting your local distributor or Michell Instruments (see www.michell.com for details).

NOTE: Refer to the relevant sections from the manual supplied with Michell's monitor.

2.7 Process Connection

The following procedures must be carried out by a qualified installation engineer.

2.7.1 Transmitter Connection

The transmitter cable is **NOT** supplied as standard.

A cable can be obtained by contacting your local distributor or Michell Instruments (see www.michell.com for details).

NOTE: Please refer to the relevant sections from the manual supplied with Michell's product, e.g. Easidew Online.

2.7.2 Monitor Connection

Note: Please refer to the relevant sections from the manual supplied with Michell's product, e.g. Easidew Online or Easidew monitor.

2.7.3 Terminal Rail Connection

The transmitter cable can be directly connected to the terminal rail. In order to do that, refer to terminal markings.

The transmitter requires a 12 to 28 V supply.

Make sure that the correct power supply is provided, otherwise the transmitter can be damaged.

3 OPERATION

3.1 Sampling Start-Up Procedure

The ES20 CSS is designed for continuous operation.

Immediately after the power is applied, all the electronic components, including the dew-point transmitter, will begin operation and all measured output signals can be viewed on a fitted monitor or wired to other receivers from the terminal rail.

It is essential that the connection of electrical and gas supplies to this instrument be undertaken by competent personnel.

Relevant sections of this manual must be read in full before commencing measurement (see below).

3.1.1 Relevant Manual Section for Operation

Please check below for the relevant product code structure and select the manual section associated with the sampling system ordered.

NOTE: Compare the 2nd (Feature B - filter) and 4th (Feature D - pressure) option from the ordered ES20 CSS product code with the table below:

Section 3.2	Section 3.3	Section 3.4	Section 3.5	Section 3.6
B1 - D1 Process Pressure with Particulate Filter	B2 - D1 Process Pressure with Coalescing Filter	B1 - D1 Atmospheric Pressure with Particulate Filter	B2 - D1 Atmospheric Pressure with Coalescing Filter	B1 - D2 Vacuum Pressure with Particulate Filter

3.2 Process Pressure With Particulate Filter

NOTE: All other options from the product configuration have no effect on the operation described in this Section.

3.2.1 Sample Flow 'Start-Up' Procedure

Proceed as follows:

1. Ensure the outlet isolation valve is fully **CLOSED.**
2. Open the inlet isolation valve slowly, making sure that the pressure indicated on the pressure gauge does not exceed the maximum operational pressure of 20 barg (290 psig). If achievable, ensure that the inlet isolation valve is fully **OPEN**.
3. Adjust the outlet isolation valve, setting the sample gas flow rate to approximately 5 Nl/min (10.6 scfh) (indicated on the flowmeter).
4. Allow the sample tubing and filter to purge for at least 15 to 30 minutes before monitoring a stable measurement.

3.3 Process Pressure with Coalescing Filter

NOTE: All other options from the product configuration have no effect on the operation described in this Section.

3.3.1 Sample Flow 'Start-Up' Procedure

Proceed as follows:

1. Ensure the outlet and drain isolation valves are fully **CLOSED**.
2. Open the inlet isolation valve slowly, making sure that the pressure indicated on the pressure gauge does not exceed the maximum operational pressure of 20 barg (290 psig). If achievable, ensure that the inlet isolation valve is fully **OPEN**.
3. Adjust the outlet isolation valve, setting the sample gas flow rate to approximately 5 Nl/min (10.6 scfh) (indicated on the flowmeter).
4. If necessary adjust the drain isolation valve to release excessive amount of liquids from the filter housing.

   NOTE: If required the drain isolation valve can be slightly OPEN. It may be necessary to adjust the inlet and outlet isolation valves to achieve normal operating conditions.

5. Allow the sample tubing and filter to purge for at least 15 to 30 minutes before monitoring a stable measurement.

3.4 Atmospheric Pressure with Particulate Filter

NOTE: All other options from the product configuration have no effect on the operation described in this Section.

3.4.1 Sample Flow 'Start-Up' Procedure

Proceed as follows:

1. Ensure the outlet isolation valve is fully **OPEN.**
2. Open the inlet isolation valve making sure that the sample gas flow rate is set to approximately 5 Nl/min (10.6 scfh) (indicated on the flowmeter).
3. Allow the sample tubing and filter to purge for at least 15 to 30 minutes before monitoring a stable measurement.

3.5 Atmospheric Pressure with Coalescing Filter

NOTE: All other options from the product configuration have no effect on the operation described in this Section.

3.5.1 Sample Flow 'Start-Up' Procedure

Proceed as follows:

1. Ensure the outlet is fully **OPEN** and drain isolation valves are fully **CLOSED**.
2. Open the inlet isolation valve making sure that the sample gas flow rate is set to approximately 5 Nl/min (10.6 scfh) (indicated on the flowmeter).
3. If necessary adjust the drain isolation valve to release excessive amount of liquids from the filter housing.

   NOTE: After adjusting the drain isolation valve it may be necessary to adjust the inlet valve to achieve normal operating conditions

4. Allow the sample tubing and filter to purge for at least 15 to 30 minutes before monitoring a stable measurement.

3.6 Vacuum Pressure With Particulate Filter

NOTE: All other options from the product configuration have no effect on the operation described in this Section.

3.6.1 Sample Flow 'Start-Up' Procedure

Proceed as follows:

1. Ensure that the control valve located on the top of the flowmeter is fully **OPEN** by turning fully counter-clockwise (valve is designed for flow adjustment only, not intended to be used as a shut-off valve).
2. Slowly open the inlet isolation valve making sure that pressure indicated on the pressure gauge is within -0.33 barg (-4.7 psig) and 0 barg (0 psig). If achievable, ensure that the inlet isolation valve is fully **OPEN.**

   Note: Ensure that the pressure indicated on the pressure gauge is showing a vacuum and that the flowmeter is not operating. If this is not the case DO NOT switch on the pump.

3. Set the valve on the flowmeter to half way (clockwise to **CLOSE**). Switch on the pump by turning on the power to it. This will allow the sample gas to flow through the system.
4. By adjusting the control valve located on the flowmeter, set the sample gas flow rate to approximately 5 Nl/min (10.6 scfh).
5. Allow the sample tubing and filter to purge for at least 15 to 30 minutes before monitoring a stable measurement.

4 GOOD MEASUREMENT PRACTICE

The ES20 CSS is designed to operate in a flowing gas stream and is suitable for the measurement of the moisture content of a wide variety of gases. In general, if the gas (in conjunction with water vapor) is not corrosive to ceramics or base metals then it will be suitable for measurement by the ES20 CSS.

The system is designed for operation with sample gas flow rates of 1-5 Nl/min (sample block). Ideally, the flow rate should be set-up between 4 and 6 Nl/min. Flow regulation is provided within the ES20 CSS. Always use high quality valve gear, coupling connections and pipework.

The system will operate successfully at flow rates within its operational range and it is important to ensure that the flow rate through the sample block is high enough to avoid long time lags in response to humidity changes at the sample source.

Avoid pressure gradients in the system by placing excessive flow restriction on the output side of the sample block. In applications where the test gas has a very high flow rate, an instrument by-pass arrangement is preferable to flow restriction after the transmitter.

Flow Rates

Theoretically flow rate has no direct effect on the measured moisture content, but in practice it can have unanticipated effects on response speed and accuracy. The optimal flow rate varies depending on the measurement technology, and can always be found in the instrument or sensor manual.

An inadequate flow rate can:

- Accentuate adsorption and desorption effects on the gas passing through the sampling system.
- Allow pockets of wet gas to remain undisturbed in a complex sampling system, which will then gradually be released into the sample flow.
- Increase the chance of contamination from back diffusion: ambient air that is wetter than the sample can flow from the exhaust back into the system. A longer exhaust (sometimes called a pigtail) can also help alleviate this problem.
- Slow the response of the sensor to changes in moisture content.

An excessively high flow rate can:

- Introduce back pressure, causing slower response times and unpredictable effects on equipment such as humidity generators.
- Result in a reduction in depression capabilities in chilled mirror instruments by having a cooling effect on the mirror. This is most apparent with gases that have a high thermal conductivity such as hydrogen and helium.

5 MAINTENANCE

5.1 General Maintenance Guidelines

Routine maintenance of the sampling system is confined to filter element replacement and regular recalibration of the dew-point transmitter.

5.2 Filter Element Maintenance

The composition of the gas determines the frequency of the filter element replacement, i.e. liquid and particulate contaminates, corrosive elements etc.

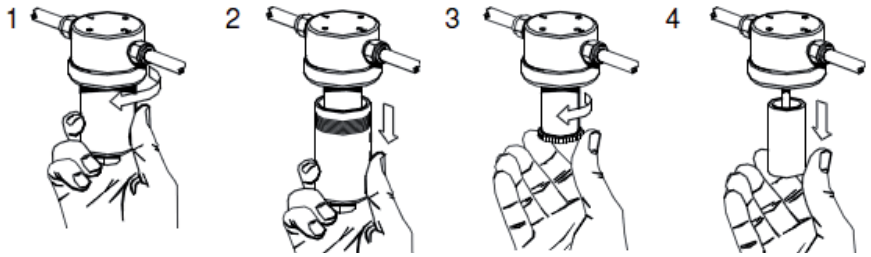
A disposable filter element continues to filter at its original efficiency as long as it is kept in service. The life of the element is determined by the increase in flow resistance caused by trapped solids in the element. The element should be changed when the flow falls below an acceptable level, or the pressure drop becomes too high. In any case the element should be replaced before the pressure drop across it reaches 0.7 barg (10.2 psig). The disposable filter elements cannot be cleaned as the solids are trapped within the depth of the element not on the surface.

5.2.1 Particulate Filter Maintenance

To replace the particulate filter element (Michell part SSF-PF-10PK (pack of 10)), proceed as follows:

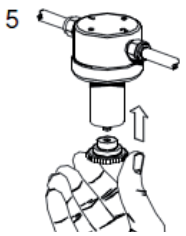
1. Switch off the pump (if fitted) and isolate any gas supplies to the sampling system.

   NOTE: Wear protective gloves when handling the filter housing.

2. 

   Remove the bowl (1,2), element retainer (3) and filter element (4).

   NOTE: In order to untighten the bowl a spanner/wrench may be needed.

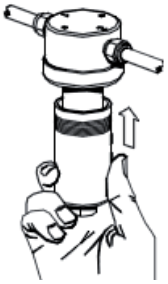


Disposable and sintered PTFE filter elements are sealed by compression against a flat surface (5). Gaskets are not required between the filter element and components of the housing. The element is located by guides which fit the inside diameter of the tube at each end.

The filter tube is securely sealed by tightening the element retainer a 1/4 to 1 turn after it first contacts the filter element, the amount will depend on the housing type and element size. A mark on the end of the retainer is used as a guide.

3. Before replacing the housing bowl ensure that the mating threads and sealing faces are clean and damage free. It is recommended that the threads and sealing faces are lubricated with a small amount of silicone grease before assembly.

4.



Re-connect the tube with its fitting to its original configuration.

5. Resume normal system operation by opening up the gas supplies to the sampling system as described in the relevant section of the Start-up Procedures (Section 3).

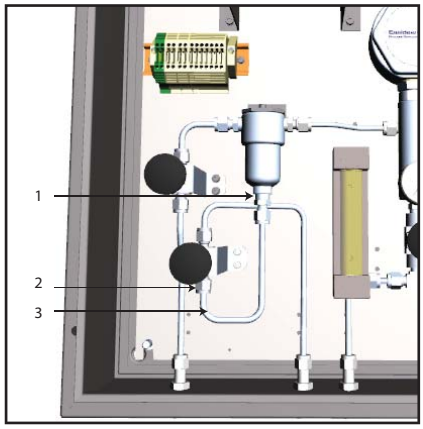
5.2.2 Coalescing Filter Maintenance

To replace the coalescing filter element (Michell part SSF-CF-10PK (pack of 10)), proceed as follows:

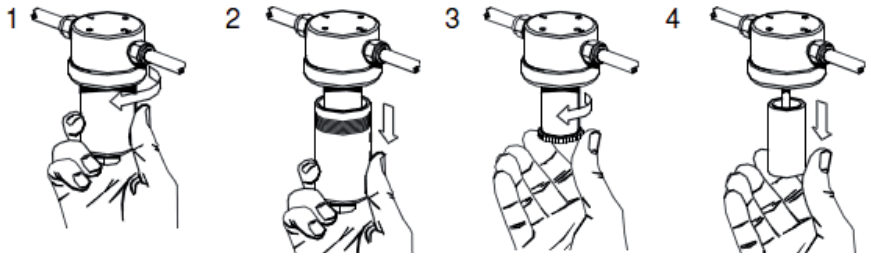
1. Isolate any gas supplies to the sampling system.

   NOTE: Wear protective gloves when handling the filter housing.

2. Unscrew the couplings (1 and 2) on the picture below.

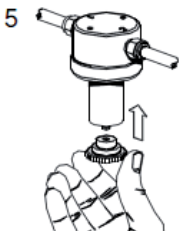


3. Disconnect the tube with its fitting (3).

4. 

   Remove the bowl (1,2), element retainer (3) and filter element (4).

   NOTE: In order to untighten the bowl a spanner/wrench may be needed.

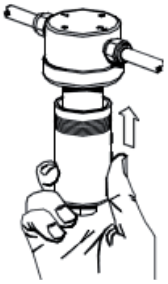


Disposable and sintered PTFE filter elements are sealed by compression against a flat surface (5). Gaskets are not required between the filter element and components of the housing. The element is located by guides which fit the inside diameter of the tube at each end.

The filter tube is securely sealed by tightening the element retainer a 1/4 to 1 turn after it first contacts the filter element, the amount will depend on the housing type and element size. A mark on the end of the retainer is used as a guide.

5. Before replacing the housing bowl ensure that the mating threads and sealing faces are clean and damage free. It is recommended that the threads and sealing faces are lubricated with a small amount of silicone grease before assembly.

6.



Re-connect the tube with its fitting to its original configuration.

7. Resume normal system operation by opening up the gas supplies to the sampling system as described in the relevant section of the Start-up Procedures (Section 3).

5.3 Transmitter Maintenance

Calibration

Routine maintenance of the Easidew transmitter is confined to regular re-calibration by exposure of the Easidew to sample gases of known moisture content to ensure that the stated accuracy of the Easidew is maintained. Calibration services traceable to the UK National Physical Laboratory (NPL) and the US National Institute of Standards and Technology (NIST) are provided by Michell Instruments.

Michell Instruments offers a variety of re-calibration and exchange sensor schemes to suit specific needs. A Michell representative can provide detailed, custom advice (for Michell Instruments' contact information go to www.michell.com).

Transmitter replacement

The composition of the gas determines the frequency of the transmitter replacement, i.e. liquid and particulate contaminates, corrosive elements, etc.

It is recommended that the transmitter is changed on an annual basis to maintain the accuracy of the system.

Michell Instruments can provide an exchange transmitter. Prior to recalibration being necessary, an exchange transmitter can be ordered from Michell Instruments or any authorized dealer. Once the transmitter and calibration certificate have been received it can be fitted and the original transmitter returned to Michell Instruments.

To replace the transmitter, proceed as follows:

1. Isolate the sampling system from the sample gas supply and switch off all electrical supplies.
2. Unplug the sensor cable, unscrew and withdraw the sensor from the sample block.
3. Fit a new/recalibrated transmitter ensuring the bonded seal is positioned between the sensor and sample block.
4. Plug in the sensor cable and resume normal system operation by opening up the gas supplies to the sampling system in accordance with the relevant section of the Start-up Procedures (Section 3).

Sensor Guard Replacement

Wear protective gloves when handling the sensor guard.

The sensor is supplied with a white HDPE guard (standard) or a stainless steel guard (if specified at time or order). The method of replacement is the same for both types.

HDPE Guard

The HDPE guard provides <10µm protection to the dew-point sensor. It is designed to show any contamination and the guard should be changed if the surface becomes discolored. When replacing the guard, care should be taken to handle the guard by the bottom part only. Replacement guards (EA2-HDPE) - pack of 10 - can be obtained by contacting Michell Instruments (www.michell.com) or your local distributor.

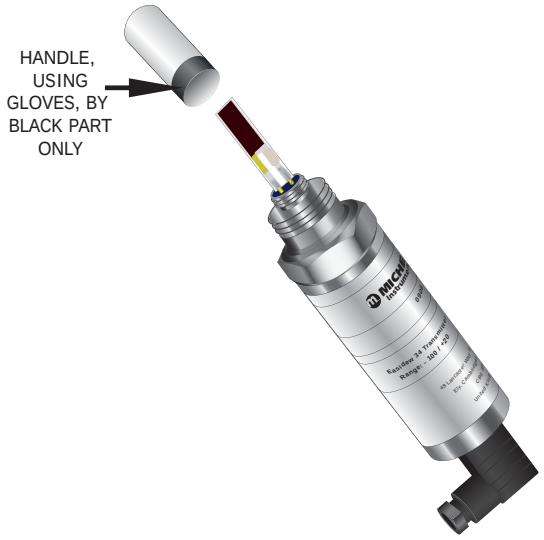


Figure 1 *Replacement of HDPE Guard*

Stainless Steel Guard

The stainless steel guard provides <80µm protection to the dew-point sensor. It is designed to show any contamination and the guard should be changed if the surface becomes discolored.

When replacing the guard, care should be taken to handle the guard by the bottom part only. A replacement guard (SSG) can be obtained by contacting Michell Instruments (www.michell.com) or your local distributor.

Bonded Seal

If the installed bonded seal gets damaged or lost, a pack of 5 replacement bonded seals can be obtained by contacting Michell Instruments, or your local distributor, and quoting part number BS-58-PK5.

Appendix A

Technical Specifications

Appendix A Technical Specifications

Electrical Specifications	
Supply Voltage (Vacuum Pump Only)	230 V AC
Operating Specifications	
Operating Temperature **ES20 fitted with:** Particulate or coalescing filter w/out monitor Particulate or coalescing filter with monitor Vacuum pump with or w/out monitor	 -50 to +60°C (-58 to +140°F) 0 to +50°C (+32 to +122°F) 0 to +40°C (+32 to +104°F)
Operating Inlet Pressure **ES20 fitted with:** Particulate Filter Coalescing Filter Vacuum Pump	 0 to 20 barg (0 to 290 psig) 0 to 20 barg (0 to 290 psig) -0.3 to 1 barg (-4.7 to 14.5 psig)
Flow Rate	1 to 5 Nl/min (2.1 to 10.6 scfh)
Mechanical Specifications	
Process Connection and Material	Inlet/outlet connections via 6mm or ¼" stainless steel fittings, 316 stainless steel
Ingress Protection No enclosure GRP & SS enclosures	 No protection (base plate only) IP66, NEMA 4X
Housing Material Base plate GRP enclosure SS enclosures	 316 stainless steel Glass fiber reinforced polyester and 4mm safety glass 316 stainless steel and 4mm safety glass
Dimensions Base plate GRP enclosure SS enclosures	 457 x 350 x 2mm (18 x 13.8 x .08") (hxwxd) 530 x 430 x 200mm (20.9 x 16.9 x 7.9") (hxwxd) 500 x 400 x 200mm (19.7 x 15.7 x 7.9") (hxwxd)
Pressure and Flow Control Atmospheric or system pressure Vacuum pressure	 Via isolation valves, pressure gauge and flowmeter Isolation valve, pressure gauge, flowmeter with valve & self-regulating vacuum pump
Gas Filtration	Particulate filter Coalescing filter
Electrical Connections Base plate GRP & SS enclosures	 Via terminal rail Via M20 plastic cable glands
Interchangeability	Fully interchangeable components
Sample Block Process Connection	Compatible with various dew-point transmitters with 5/8" process connection
Dew-Point Measurement Specifications (Optional)	
Measurement Range (dp)	-100 to +20°Cdp (-148 to +68°Fdp)
Accuracy (dp)	up to ±1°Cdp up to ±2°Cdp

Appendix B

Quality, Recycling & Warranty Information

Appendix B Quality, Recycling & Warranty Information

B.1 Pressure Equipment Directive (PED) 97/23/EC

The above Directive has been implemented in United Kingdom Law by the Pressure Equipment Regulations 1999.

The Regulations require that all pressure equipment and assemblies within the scope of the Pressure Equipment Directive must be safe when placed on the market or put into service.

Michell Instruments' products have been assessed and, as referenced against the Classification Charts detailed in Annex II of the Directive, do not fall into the requirements for CE marking compliance with the Pressure Equipment Directive.

Article 3, paragraph 3 states that any product containing a pressurized fluid that does not qualify for compliance should, nevertheless, be constructed with Sound Engineering Practice (SEP).

Michell Instruments attests here that its products have been designed, manufactured & tested to assure safe operation, and in accordance with Sound Engineering Practices.

B.2 Recycling Policy

Michell Instruments is concerned with the protection of the environment. It is our commitment to reduce and eliminate from our operations, wherever possible, the use of substances which may be harmful to the environment. Similarly, we are increasingly using recyclable and/or recycled material in our business and products wherever it is practical to do so.

To protect natural resources and to promote material reuse, please separate batteries from other types of waste and recycle responsibly. If batteries are not properly disposed of, these substances can cause harm to human health and the environment.

The product that you have purchased may contain recyclable and/or recycled parts and we will be happy to provide you with information on these components if required. For further information please see the following sections.

B.3 WEEE Compliance

Directive 2012/19/EU 4 July 2012 on Waste Electronic and Electrical Equipment (WEEE)

The Waste Electronic and Electrical Equipment (WEEE) Directive places rules upon European manufacturers of electrical and electronic equipment. The directives' aim is to reduce the impact that electronic devices have on the environment.

Michell Instruments is in full compliance with the WEEE Directive and is registered with an approved recycler (Registration No. WEE/JB0235YW) and treats the requirement of the directive and the protection of the environment with the utmost importance. All Michell Instruments' products are appropriately marked indicating their requirement for recycling.

It may be required to return certain instruments for treatment at the end of their working life.

Feb 2013

B.4 RoHS2 Compliance

Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011

The Restriction of Hazardous Substances (RoHS) Directive places rules upon European manufacturers of electrical and electronic equipment. The directives' aim is to reduce the impact that electronic devices have on the environment.

According to the EC Directive 2002/95/EC, Michell Instruments' products qualify as Category 9, Control and Monitoring Equipment. Under the 2002/95/EC Directive, Category 9 products are exempt from compliance with the Directive.

However, the careful design of all Michell Instruments' products takes into consideration the requirements of the Directive and, wherever possible, compliance is achieved. All future products will be developed entirely using compliant materials. Furthermore, Michell Instruments is taking active steps to remove non-compliant materials and components from existing products wherever these may occur. Presently, none of the non-compliant materials are known to occur in Michell Instruments' products.

The new Directive 2011/65/EU (RoHS2) entered into force on 21 July 2011 and required all Member States to transpose the provisions into their respective national laws by 2 January 2013.

Under the provisions of the RoHS2 EU Directive 2011/65/EU (Article 3, [24]) defines 'Control and Monitoring Equipment' specifically as 'monitoring and control instruments designed exclusively for industrial or professional use'.

RoHS2 EU Directive 2011/65/EU states the closing date for compliance of any Control and Monitoring Equipment product sold into the EU market place as 22nd July 2017.

However, the careful design policy of all Michell Instruments' products continues to attain compliance in the shortest practical timescales and strives to ensure that less than 0.1% of total mass per product, of all non-compliant materials, appear within them. Michell Instruments continues to monitor suppliers and material sources to ensure that compliance of goods provided is maintained.

January 2013

B.5 Warranty

Unless otherwise agreed, the Supplier warrants that, as from the date of delivery for a period of 12 months, the goods and all their component parts, where applicable, are free from any defects in design, workmanship, construction or materials.

The Supplier warrants that the services undertaken shall be performed using reasonable skill and care, and be of a quality conforming to generally accepted industry standards and practices.

Except as expressly stated, all warranties whether express or implied, by operation of law or otherwise, are hereby excluded in relation to the goods and services to be provided by the Supplier.

All warranty services are provided on a return to base basis. Any transportation costs for the return of a warranty claim shall reside with the Customer.

B.6 REACH Compliance

Regulation (EC) No. 1907/2006
Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

Michell Instruments is a manufacturer of moisture measurement and gas analysis instrumentation and is a 'downstream' user of chemicals, as described by the EU Council Directive 76/769/EEC. The products we supply are not raw chemical products (goods).

Under normal and reasonably foreseeable circumstances of application, the goods supplied to you shall not contain or release any prohibited chemicals. No listed SVHC (Substances of Very High Concern) appear within products manufactured by Michell Instruments. Therefore the 0.1% mass per product, or total usage of 1 tonne/year, will never be exceeded. For these reasons we are neither required by obligation for registration nor for the creation of material safety data sheets (MSDS) for our products.

Our continued review of the SVHC Candidate List and latest additions is to ensure we remain compliant.

Michell Instruments maintains a hazardous material register in which MSDS data sheets are collated, and we will check that our suppliers will comply to REACH requirements for all materials and substances we use in the processes of our manufacturing.

In the unlikely event that any chemicals of concern appear in our products in quantities greater than 0.1% of total mass per product we will immediately inform you by correspondence according to the REACH Article 33 requirements. Our current appraisal is, however, that we do not expect or foresee such an incidence.

January 2013

B.7 Calibration Facilities

Michell Instruments' calibration facilities are among the most sophisticated in the world and have been recognized for their excellence.

Traceability to the National Physical Laboratory (NPL) UK is achieved through our UKAS Accreditation (Number 0179). This covers dew point over the range -90 to +90°C (-130 to +194°F) and also Relative Humidity.

Dew-point calibrations are also traceable to the National Institute for Standards & Technology (NIST) USA over the range -75 to +20°C (-103 to +68°F).

NOTE: Standard traceable calibration certificates for instruments and sensors are not issued under our UKAS accreditation. UKAS certificates are usually to special order and are clearly identified.

B.8 Return Policy

If a Michell Instruments' product malfunctions within the warranty period, the following procedure must be completed:

1. Notify a Michell Instruments' distributor, giving full details of the problem, the model variant and the serial number of the product.
2. If the nature of the problem indicates the need for factory service then the instrument should be returned to Michell Instruments, carriage prepaid, preferably in the original packaging, with a full description of the fault and the customer contact information.
3. Upon receipt, Michell Instruments will evaluate the product to determine the cause of the malfunction. Then, one of the following courses of action will be taken:
   - If the fault is covered under the terms of the warranty, the instrument will be repaired at no cost to the owner and returned.
   - If Michell Instruments determines that the fault is not covered under the terms of the warranty, or if the warranty has expired, an estimate for the cost of the repairs, at standard rates, will be provided. Upon receipt of the owner's approval to proceed, the product will be repaired and returned.

B.9 Manufacturing Quality

Michell Instruments is registered with the British Standards Institute for Quality Assurance to:

BS EN ISO 9001: 2008

Rigorous procedures are performed at every stage of production to ensure that the materials of construction, manufacturing, calibration and final test procedures meet the requirements laid down by our BSI approved Quality System.

Please contact Michell Instruments (www.michell.com) if the product does not arrive in perfect working order.

Appendix C

Return Document & Decontamination Declaration

Appendix C Return Document & Decontamination Declaration

Decontamination Certificate

IMPORTANT NOTE: Please complete this form prior to this instrument, or any components, leaving your site and being returned to us, or, where applicable, prior to any work being carried out by a Michell engineer at your site.

Instrument			Serial Number	
Warranty Repair?	YES	NO	Original PO #	
Company Name			Contact Name	
Address				
Telephone #			E-mail address	
Reason for Return /Description of Fault:				

Has this equipment been exposed (internally or externally) to any of the following? Please circle (YES/NO) as applicable and provide details below		
Biohazards	YES	NO
Biological agents	YES	NO
Hazardous chemicals	YES	NO
Radioactive substances	YES	NO
Other hazards	YES	NO
Please provide details of any hazardous materials used with this equipment as indicated above (use continuation sheet if necessary)		
Your method of cleaning/decontamination		
Has the equipment been cleaned and decontaminated?	YES	NOT NECESSARY

Michell Instruments will not accept instruments that have been exposed to toxins, radio-activity or bio-hazardous materials. For most applications involving solvents, acidic, basic, flammable or toxic gases a simple purge with dry gas (dew point <-30°C) over 24 hours should be sufficient to decontaminate the unit prior to return.
Work will not be carried out on any unit that does not have a completed decontamination declaration.

Decontamination Declaration

I declare that the information above is true and complete to the best of my knowledge, and it is safe for Michell personnel to service or repair the returned instrument.

Name (Print)		Position	
Signature		Date	

MICHELL Instruments

F0121, Issue 2, December 2011

http://www.michell.com

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